

10/620,468

REMARKS

Claims 55-68 are pending in the application with claims 1-54 and 69-78 previously cancelled.

Claims 55, 56, and 58-61 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al (U.S. 6,100,195) in view of Hem P. Takiar (UK 2184288). Applicant requests reconsideration.

Claim 55 sets forth a conductive connection forming method that includes, among other features, forming a first layer containing copper and forming a second layer containing a second metal different from copper over the first layer. The second metal contains palladium. The method includes incorporating at least some of the palladium into an intermetallic layer containing the palladium and copper and having a thickness of from about 50 to about 150 Angstroms. At least a portion of any second metal that is not incorporated into the intermetallic layer is removed; exposing the intermetallic layer. A conductive connection is formed directly to the intermetallic layer without a passivation layer therebetween. Pages 2-3 of the Office Action allege that Chan discloses every limitation of claim 55 except for the intermetallic layer thickness and relies upon Takiar as allegedly remedying such deficiency. Applicant traverses.

The Office Action relies upon the Abstract and Fig. 7 of Takiar as allegedly disclosing the claim 55 intermetallic layer thickness of from about 50 to about 150 Angstroms. At least page 1, lines 103-124 of Takiar further discuss the relied upon text in the Abstract. Also, page 2, line 127 to page

10/620,468

3, line 7 of Takiar state that layer 30 shown in Fig. 7 includes only palladium. Palladium is not an intermetallic. Accordingly, review of Takiar does not reveal any disclosure or suggestion of an intermetallic layer thickness. Applicant asserts that mere description of a palladium layer thickness does not constitute disclosure or suggestion of the claimed intermetallic layer thickness containing palladium and copper. At least for such reason, Applicant asserts that Chan in view of Takiar fails to disclose or suggest every limitation of claim 55.

As alleged motivation for combining Chan and Takiar, page 3 of the Office Action states that Takiar supports using palladium layer 30 in the method of Chan since Takiar states that palladium has a very low diffusivity into copper. Although unclear from the Office Action, it appears that the Office proposes replacing alloy 61 containing copper-palladium with palladium layer 30 of Takiar. Applicant notes that Fig. 2G of Chan and the accompanying text in column 4, lines 56-60 expressly describe removing any palladium, leaving behind alloy 61 containing copper-palladium. Accordingly, substitution of Chan's alloy layer 61 for Takiar's palladium layer 30 would result in removal of the palladium layer 30 during the selective etching shown in Fig. 2G. Accordingly, the proposed substitution would render the Chan process inoperable for its intended purpose. At least for such reasons, no suggestion or motivation can be considered to exist to make the proposed modification.

10/620,468

In addition, a person of ordinary skill relying upon statements in Takiar would find that it teaches against the Office's proposed substitution. At page 1, lines 112-114 Takiar states that palladium "displays a very low level of migration into the underlying copper" and that "copper resists migration into the palladium," even at high temperatures. Fig. 2F of Chan, along with column 4, lines 50-55, describes annealing at from about 200° C to about 400° C to form copper-palladium alloy in copper layer 56. The Takiar statement that palladium displays a very low level of migration into copper even at high temperatures tends to motivate against substituting alloy layer 61 of Chan with palladium layer 30 of Takiar as further frustrating the intended purpose of providing a copper-palladium alloy. Forming alloy layer 61 apparently involves migration of palladium into copper layer 56. At least for such additional reasons, Applicant asserts that no motivation exists to combine Chan and Takiar.

Since the cited combination of Chan and Takiar fails to disclose every limitation of claim 55 and no motivation exists for the combination, claim 55 is patentable over Chan in view of Takiar. Claims 56 and 58-61 depend from claim 55 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested. Thus, Applicant requests allowance of claims 55, 56, and 58-61 in the next Office Action.

Claim 57 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Chan in view of Takiar as applied to claim 55 above, and

10/620,468

further in view of McTeer (U.S. 6,069,075). Applicant requests reconsideration.

Claims 57 depends from claim 55 discussed above. McTeer fails to disclose or suggest and is not alleged to disclose or suggest the subject matter established above as absent from Chan in view of Takiar, as applied to claim 55. Accordingly, claim 57 is patentable over the cited combination of references. In addition, as may be appreciated from the discussion below regarding the deficiencies of Chan in view of McTeer as applied to claim 64, the cited combination fails to disclose or suggest the annealing temperature set forth in claim 57. At least for such reason, Applicant requests allowance of claim 57 in the next Office Action.

Claims 64-68 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al in view of McTeer. Applicant requests reconsideration.

Claims 64 sets forth an integrated circuit via forming method that includes, among other features, forming a first level of integrated circuit wiring containing copper, forming an intermetallic material at least partially within the first wiring level at a temperature of greater than 400 to about 500° C, and forming a conductive via on and in electrical contact with the intermetallic material. The intermetallic material contains copper and palladium. Pages 6-7 of the Office Action allege that Chan discloses every limitation of claim 65 except for the temperature and relies upon McTeer as allegedly remedying such deficiencies. Applicant traverses.

10/620,468

The Office Action alleges that the annealing process in column 3, line 3 to column 4, line 5 of McTeer discloses the step in claim 64 of forming an intermetallic material containing copper and palladium at a temperature of greater than 400 to about 500° C. Review of McTeer does not reveal any evidence that the annealing process described therein applies to elements other than titanium and aluminum or applies to objectives other than producing surface roughness to reduce reflectance. Regardless of the disclosures in McTeer pertaining to titanium-aluminum metal stacks and producing surface roughness, McTeer fails to disclose or suggest forming an intermetallic material containing copper and palladium.

Applicant acknowledges that page 6 of the Office Action alleges that Chan discloses the claimed forming of intermetallic material. However, no logical connection exists between the copper-palladium alloy layer 61 of Chan and the titanium-aluminum layer 18 of McTeer having a roughened surface. Page 7 of the Office Action alleges a motivation to apply the McTeer annealing process to the Chan copper-palladium alloy layer 61 to reduce reflectance or form an anti-reflective coating. Nevertheless, no support exists in the art or in the Office Action for the proposition that annealing copper-palladium alloy layer 61 necessarily produces a surface roughness and reduces reflectance. Those of ordinary skill clearly would not expect annealing aluminum and titanium to necessarily produce the same result as annealing copper and palladium. Accordingly, the alleged motivation by the Office does not exist in the art.

10/620,468

It appears the Office takes the position that annealing copper and palladium layers inherently produces the surface roughness and reduced reflectance obtained by annealing titanium and aluminum layers. However, the mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish an inherent result. The Office must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. Since no evidence exists that annealing copper and palladium layers forms an anti-reflective coating, no motivation can be considered to exist to apply the McTeer annealing process for titanium and aluminum layers to Chan. At least for such reason, Chan in view of McTeer fails to disclose or suggest every limitation of claim 64.

Claims 65-68 depend from claim 64 and are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested. Applicant requests allowance of claims 64-68 in the next Office Action.

Claims 62 and 63 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Chan in view of McTeer and Takiar. Applicant requests reconsideration.

Claim 62 sets forth an oxidation protection method that includes, among other features, forming a second metal-containing material over a first metal-containing material, annealing the first and second metal-

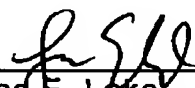
10/620,468

containing materials at a temperature of greater than 400 to about 500° C to form an intermetal material having a thickness of from about 50 to about 150 Angstroms. As may be appreciated from the discussion above regarding the deficiencies of Takiar as applied to claim 55 and the deficiencies of McTeer as applied to claim 64, applicant asserts that the cited combination fails to disclose or suggest the annealing temperature and the intermetal material thickness set forth in claim 62. Claim 63 depends from claim 62 and is patentable at least for such reason as well as for the additional limitations in such claims not disclosed or suggested. Applicant requests allowance of claims 62 and 63 in the next Office Action.

Applicant herein establishes adequate reasons supporting patentability of claims 55-68 and requests allowance of all pending claims in the next Office Action.

Respectfully submitted,

Dated: 22 Jun 2005

By: 
James E. Lake
Reg. No. 44,854